many is concerned, all this ought to be changed. However that may turn out to be, it can scarcely be doubted that his doctrines in regard to chronic non-visceral pelvic inflammations, together with the immense contributions made in this country, by himself and others, to our means of combating those affections, will exert a marked effect upon practice the world over, although, no doubt, that effect may be gradual in its development.

After the meteoric brilliancy of Dr. Sims's earlier achievements, the practical acumen and the comprehensive mental grasp displayed in Dr. Thomas's great work, and the logical straightforwardness of Dr. Emmet's doctrines, together with the mechanical ingenuity that stands out in his writings—after all these have been duly digested abroad, and when, as is now the case, all these men are daily quoted, we may well feel a glow of satisfaction at the influence our countrymen have attained to in gynæcology. The seed planted by Ephraim McDowell, trodden under foot as it was at the outset, has sprung up into a plant which, although slow of growth, now rears a sturdy trunk.

Special Articles.

PURULENT, CROUPOUS OR MEMBRANOUS, AND DIPHTHERITIC CONJUNCTIVITIS IN INFANTS.[*]

By CHARLES STEDMAN BULL, A. M., M. D.

OPHTHALMIA NEONATORUM, or purulent conjunctivitis of infants, has from early times been recognized as the typical form of suppurative inflammation of the conjunctiva. Owing to the well-known symptoms of the disease, the course which it runs, and the dangers which it entails upon the eye, comparatively little discussion has arisen upon the subject except in regard to two points—the causation of the disease and its prophylaxis. The same can not be said for either membranous or diphtheritic conjunctivitis, though certainly

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[*] Galezowski.—" Ann. de Gynéc.," March, 1881.
Abegg.—" Arch. f. Gynäk.," xvii, 3, 1881.
Credé.—*Ibid.*, xvii, 1, 1881.
Olshausen.—" Centralbl. f. Gynäk.," Jan. 22, 1881.
Graefe.—Volkmann's " Samml. klin. Vortr.," No. 192.

in the latter disease the symptoms are as pronounced and unmistakable as in the purulent form of inflammation. The apparent connection which exists in some cases, clinically, between the purulent and membranous forms of conjunctivitis in new-born children, is much closer and more real than any which is claimed to exist between the membranous and diphtheritic forms of inflammation. Most ophthalmic surgeons occasionally see cases of purulent conjunctivitis in which the discharge at a certain period becomes more coagulable and assumes the form of a membrane; and this process is certainly at first distinct from the conjunctivitis which begins as membranous and subsequently becomes purulent.

PURULENT CONJUNCTIVITIS.—True purulent conjunctivitis begins, probably in the majority of cases, as a catarrhal inflammation, with mucoid or muco-purulent secretion; but the latter rapidly becomes thicker, more cloudy, yellow, and really purulent. Sometimes the change from catarrhal to purulent inflammation is so rapid that the former stage escapes observation, especially if the physician is not on the lookout for ophthalmia. The disease, according to nearly all authorities, begins on the second or third day after birth, though it may appear on the first day, or may be postponed to the fifth. If it does not appear until after the fifth day, the suspicion is aroused that the contagion has occurred since birth, and from some other cause than inoculation with the vaginal discharge of the mother during parturition.

The symptoms of a well-marked case are easily enumerated : Swelling of the tissue of the eyelids; redness of the cutaneous surface, sometimes amounting to lividness; more or less sticking of the lid-margins together; the appearance of a purulent discharge when the lids are opened; marked injection of the ocular conjunctiva, accompanied generally by some chemosis; sometimes the lids are so swollen as to prevent their eversion, but, where they can be turned out, the retro-tarsal fold is found enormously swollen, as is also the papillary portion of the tarsal conjunctiva, and covered by a yellow exudation, which may be more or less flocculent or even stringy. There is great heat of skin in the immediate vicinity, and sometimes a slight rise in the general temperature. This condition lasts a varying length of time, usually from four to six days, and then the acute inflammatory symptoms begin to subside, though the purulent discharge may be very profuse for a much longer period. Both eyes are almost always affected, though usually one before the other.

Though in the great majority of cases the disease runs the course just depicted, yet there are exceptions. In some instances the ropy, fibrinous exudation which is noticed in the beginning continues to the end, and is accompanied by patches of coagulation upon the conjunctiva itself, which may leave white spots behind them, though this is very exceptional. In other not very rare, cases, the flocculent, fibrinous material is deposited continuously over the whole tarsal surface of the conjunctiva, and resembles a membrane very closely. It is, however, friable, and, though easily removed by the forceps, comes away in small bits or shreds, and rarely in one continuous

piece. It always leaves a raw, bleeding surface, and the hæmorrhage is sometimes quite profuse. This may not form again, though it usually does. With this pseudo-membranous formation there is also an abundant purulent discharge, which lasts long after the pseudo-membrane has ceased to be formed. These cases resemble closely the cases described by some of the German authors as croupous conjunctivitis, though it is proper to state that the membrane in the latter is usually coextensive with the palpebral conjunctiva, and moderately thick. They seem to be cases of the disease in which the products of inflammation are of a more highly organized type.

Purulent conjunctivitis of infants, though comparatively rare in the higher classes, is of very frequent occurrence among the lower orders, and is especially rife in hospitals for the confinement of women. Credé's statistics cover a period of seven years—from 1874 to 1880, inclusive; there were, in this period, 2,466 births and 227 cases of purulent ophthalmia, but the percentage varied somewhat from year to year, and during the last year became very small. In 1874 there were 323 births and 45 cases of conjunctivitis, or 13·6 per cent. In 1875 there were 287 births and 37 cases, or 12·9 per cent. In 1876 there were 367 births and 29 cases, or 9·1 per cent. In 1877 there were 360 births and 30 cases, or 8·3 per cent. In 1878 there were 353 births and 35 cases, or 9·8 per cent. In 1879 there were 389 births and 36 cases, or 9·2 per cent. In 1880, up to May 31st, there were 187 births and 14 cases, or 7·6 per cent., but for the remainder of the year there were 200 births and 1 case, or only 0·5 per cent. The reason for this marked falling off in the number of cases will be stated farther on. Olshausen's percentage of cases is larger than Credé's later percentage, for out of 550 births there were 69 cases of purulent conjunctivitis, or more than 12·5 per cent. Galezowski, since 1870, has observed 507 cases of purulent ophthalmia out of a total of 60,152 cases of disease of the eyes, and among these there were 111 cases of serious results, ending either in permanent diminution or total loss of vision.

As regards the causation of the disease, there seems to be but one opinion among recent writers, whether from the ophthalmological or from the obstetrical standpoint, viz. : that the ophthalmia of new-born children is in the great majority of cases due to inoculation during parturition with the muco-purulent or purulent discharge from the vagina of the mother. The appearance of the disease so soon after birth and the almost constant occurrence of a vaginal discharge in the mothers both point in this direction. The latter, however, can not be regarded as the only cause, for cases now and then occur of purulent conjunctivitis where the mothers have had no discharge from the vagina. This vaginal secretion need not be purulent, for an ordinary vaginal catarrh or the lochial discharge has been known to cause many cases of purulent conjunctivitis in infants.

The disease may be, and often is, communicated by carelessness and uncleanliness on the part of nurses, mothers, and other attendants, often in the washing of the children after birth or in handling them subsequently, by

carrying the vaginal discharge upon the fingers or upon the bedding or clothing. The danger from this carelessness and uncleanliness on the part of attendants helps to explain the frequent epidemic appearance of ophthalmia neonatorum in lying-in hospitals and foundling asylums, though another important factor in the causation of these epidemics is the influence of the badly-ventilated rooms and wards in these buildings, where, perhaps, similar epidemics have previously occurred, thus poisoning air, walls, and floors, as well as the contents of these rooms and wards. Still, cases do occur in which no contagion can be traced, and here it has been customary to refer the outbreak of the disease to a sudden draught of air, maintenance in an impure atmosphere, or sudden exposure to very bright light; which influences, acting upon an already existing catarrhal conjunctivitis, may change the latter to a purulent form of conjunctivitis.

Credé, who writes of the disease from the obstetrician's standpoint, states that in his experience the cases of ophthalmia in new-born children have been, almost without an exception, caused by direct contact of the vaginal secretion with the eyes during parturition. In his opinion, the infectious character of a vaginal secretion continues long after the specific gonorrhœal symptoms have disappeared. Even in cases where almost no secretion from the vagina of the mother exists, purulent ophthalmia in the child has still been known to follow within the first few days after birth. Galezowski, who writes from the ophthalmic surgeon's standpoint, says that it is always caused by the introduction of the leucorrhœal or gonorrhœal vaginal secretion between the eyelids of the infant during parturition, and Abegg agrees with him.

Recognizing this fact in the etiology of the purulent conjunctivitis of infants, our main endeavors should be directed toward preventing the occurrence of the disease. The practical question is one of prophylaxis, and to this end the care of the disease must be placed in the hands of the obstetrician and those of the nurse, and on them must rest the responsibility of the result. When it is considered how many cases of permanent disability from blindness, which fill our blind asylums, are due to this cause, it will readily be seen how grave is this responsibility, and how very necessary it is, not only that the disease should be properly treated, but that the treatment should be prophylactic. As a precautionary measure, the vagina of the mother should be kept thoroughly cleansed for some days before confinement, though the uncertainty of the occurrence of the latter renders the duration of the former equally uncertain.

Credé employed this method of cleansing and disinfecting the vagina, but the effects upon the occurrence of ophthalmia were trifling and unsatisfactory: the cases of conjunctivitis diminished, but did not disappear. He then began to disinfect the babies' eyes, and the result was at once surprisingly favorable. In all cases of vaginal gonorrhœa and catarrh in the institution under his care frequent disinfection was practiced with weak carbolic- and salicylic-acid solutions (2 : 100). The first trials on the babies' eyes

were made with a 1 : 60 solution of boracic acid. This not proving satisfactory, he began to use a 1 : 40 solution of nitrate of silver, injected between the eyelids shortly after birth, first washing the eyes with the weak salicylic-acid solution. All the eyes thus treated remained well. During the year ending June, 1881, the treatment was as follows: The unclosed lids were first carefully cleansed with fresh water; then a few drops of a 1 : 50 solution of nitrate of silver were dropped into the gently-opened lids; then for twenty-four hours applications of the salicylic-acid solution (2 : 100) were made to the eyelids. All these babies remained free from the disease.

Olshausen first used as a prophylactic a one-per-cent. solution of carbolic acid as a wash for the eyes; this reduced the percentage of cases of ophthalmia from 12·5 to 6 per cent. in two years. Immediately after the birth of the child, even before the breech is born, the still closed lids of the infant are to be washed with this carbolic-acid solution, and then the eyes are cleansed with the same solution. As a result of this treatment, among 166 children born in 1880, only 6 cases of purulent ophthalmia appeared, or 3·6 per cent.; and these cases were very mild, and some of them were limited to one eye. He does not employ either the nitrate-of-silver solution or the continuous bathing with the salicylic-acid solution, as the latter demands constant attention.

In the lying-in department of the Dantzig hospital, under the charge of Dr. H. Abegg, since the precaution has been taken of carefully washing the lids and conjunctival sac immediately after birth, the results have been very satisfactory. Out of a total of 2,266 births during the ten years between 1871–80, only 66 cases of ophthalmia occurred, or 3 per cent.

The prophylactic measures recommended by the writer are as follows: In all cases of vaginal discharge in parturient women, whether specific or not, the vagina should be carefully cleansed and disinfected repeatedly before parturition begins. As soon as the child is born the external surface and edges of the eyelids should be carefully cleansed with a one- or two-per-cent. solution of carbolic acid, and then the conjunctival cul-de-sac washed out with some of the same solution, or with a saturated solution of boracic acid. This must be done by the attending physician, or by a skilled nurse under his supervision. The eyes of all new-born children should be carefully watched for the first week or ten days, and, whenever any signs of an ordinary catarrhal conjunctivitis appear, the conjunctiva should be thoroughly brushed over with a solution of nitrate of silver, from 2 to 5 grains to the ounce of water.

If the conjunctivitis has become purulent, and the case is one of real ophthalmia neonatorum, the child should, if possible, be isolated from all healthy infants, and have its own bath-tub. If this is not possible, the diseased infant should be bathed *last*, and no sponges should be used, but only cloths, which can afterward be destroyed. If one eye only is affected, do not apply the hermetically-sealed bandage to the sound eye, but envelope the arms or hands of the baby, so as to prevent the secretion from being carried to the

4

fellow-eye, and lay the child upon the side corresponding to the diseased eye.

The most important feature in the treatment is enforced cleanliness. This requires constant attention and the frequent use of some soft cloths and plenty of water. The use of cold cloths, dipped in cold water or even iced water, and laid on the eyelids, must be regulated by the amount of swelling of the lids and heat of the parts. As soon as the lids can be everted, the proper treatment is a thorough application of nitrate of silver to the conjunctiva of the lid and retrotarsal fold, daily, and sometimes twice a day. If this is thoroughly done, a five-grain solution will in most cases suffice; but, where there are profuse secretion and considerable swelling of the conjunctiva, a ten-grain solution becomes necessary. When, owing to marked hypertrophy of the papillary structure of the conjunctiva, a stronger caustic becomes necessary, it is better to discard solutions, and employ the lapis mitigatus (one part nitrate of silver to two parts nitrate of potassium), and neutralize its effect by a subsequent washing with a solution of common salt.

It is well to employ a one-grain solution of sulphate of atropia in a saturated solution of boracic acid in every case of purulent ophthalmia, as the great danger in this disease is purulent infiltration and perforation of the cornea. Should this infiltration occur at the center of the cornea, the atropia should be instilled frequently, for, if perforation occurs, the dilatation of the pupil will prevent a large prolapse of the iris through the perforation. If the infiltration of the cornea, on the contrary, be at or near the margin, it is better to employ a two-grain solution of the sulphate of eserine, as thus an extensive prolapse of the iris may be prevented if the ulcer perforate. In all cases the cleansing and washing of the lids and conjunctiva should be done with a saturated solution of boracic acid, and the atropine and eserine should be dissolved in the same.

MEMBRANOUS CONJUNCTIVITIS.—Though most German authorities, and some others, regard croupous or membranous conjunctivitis as a distinct disease, differentiating it both from purulent and from diphtheritic conjunctivitis, yet the writer regards this as extremely doubtful, at least so far as the purulent form of inflammation is concerned. Saemisch defines croupous conjunctivitis as that variety of inflammation which is characterized by the formation of a more or less extensive membrane *upon* the surface of the conjunctiva of the lids. The intensity of the inflammatory process varies in different cases: in some the membrane is a very thin, perfectly transparent, thread-like gelatinous layer, while in others it is denser, thicker, opaque, and yellowish-white in color; and this may sometimes be removed in one entire membrane from the *surface* of the conjunctiva. When the membrane is of the latter character, it adheres with tolerable firmness to the conjunctiva, and can not be easily wiped off, but must be removed with the forceps, and always leaves a bleeding surface beneath it. The gelatinous layer of exudation, on the other hand, is easily removed with a small brush or bit of muslin, and, if this is done carefully, does not leave a bleeding surface beneath it. The lids are

reddened and swollen as in the purulent form of the disease, and there is, moreover, a more or less abundant flocculent secretion, which may be purulent from the beginning. Saemisch says that the disease subsequently runs into the catarrhal or purulent form of inflammation, but it is certain that in the large majority of cases the flocculent, more or less purulent secretion is present from the beginning.

From the further statement of Saemisch, that in a small number of cases the croupous form merges into the diphtheritic, the writer ventures to decidedly dissent, holding that the croupous and diphtheritic forms of conjunctivitis are two distinct diseases, differing in their pathology and pathogenesis. The pathological process in the croupous form of conjunctivitis consists mainly in the deposit of an albuminous exudation, probably fibrine, *upon the surface* of the inflamed conjunctiva, which deposit rapidly coagulates on exposure to the air, and thus assumes the form of a membrane. This deposit contains cells which have made their exit from the mucous membrane, and upon the number of these cells depends more or less the firmness and density of this membrane, as may be shown by a microscopic examination. When this membrane is removed, either as a slough by the processes of nature, or by the forceps in the hand of the surgeon, the mucous membrane lies bare, deprived of its epithelium throughout a varying extent; but there is *no loss of substance* of the conjunctiva, and but *very little infiltration* of its tissue; and here is the point at which croupous inflammation differs from diptheritic inflammation, as will be shown farther on.

When the membrane has been removed, it may form again, or the exudation may assume the purulent form, and then we have a purulent ophthalmia to deal with, and the epithelial layer is reformed. The writer is strongly inclined to believe, though still with some hesitation, that these cases of conjunctivitis in which the formation of a pseudo-membrane is the characteristic feature are cases in which the conjunctival inflammation is of the same nature as the purulent form, but in which the exudation is for a time of a higher organization. Even those authors who insist most strenuously that membranous conjunctivitis should be regarded as a distinct disease, admit that in very many cases of purulent conjunctivitis the exudation at first coagulates very rapidly on exposure to the air, and thus forms a pseudo-membrane over the surface of the conjunctiva. The tendency to this coagulation of the exudation is very often seen in cases of catarrhal conjunctivitis, though a continuous pseudo-membrane, covering the entire surface, is never formed in these cases.

The writer has recently had an opportunity of noting the occasional marked tendency to the formation of a pseudo-membrane in purulent conjunctivitis. During the months of January, February, and March of this year there occurred quite a number of cases of purulent ophthalmia in infants at the Nursery and Child's Hospital in this city. Out of a total of 27 cases of purulent conjunctivitis the tendency to the formation of this pseudo-membrane was noted in 13, and in several of these the membrane covered the entire palpebral conjunctiva. In only two cases was the mem-

brane of any degree of thickness, but these two required the forceps for its removal. In no other respect did they differ from the ordinary type of puru-lent conjunctivitis. Several of these pseudo-membranous formations were examined microscopically by the writer. Running in every direction through the tissue were delicate fibrillæ of connective tissue, which in some places were collected together into larger fibrillæ. There were large numbers of round cells, so-called exudation corpuscles, and a large amount of fine, amor-phous, granular matter. The meshes were generally small and close, though in places they were quite loose. In some places the fibrillæ were so close together as to appear to form laminæ, and these apparent laminæ were ar-ranged in arcs of concentric circles, though they never formed complete circles. The fibrillæ were more numerous on the external surface of the pseudo-membrane, showing there a higher grade of organization.

The treatment of these cases of membranous formation does not differ from that of the ordinary form of purulent conjunctivitis. It must be strictly antiphlogistic and disinfectant, by the application of cold cloths and the use of a saturated solution of boracic acid or of a one-per-cent. solution of carbolic acid for cleansing purposes. As fast as the discharge appears it must be removed, either with a small brush or with a piece of soft muslin. If the pseudo-membrane be of the thin, gelatinous variety, it may easily be removed; but, if it be dense and firm, no attempt at removal should be made, as it is better to wait until it is cast off as a slough. During the early stage no caustics should be employed, but, when the purulent secretion has become established, the same remedies are indicated as in the purulent form of the disease. The indications for the use of atropine or eserine are the same as before mentioned. Attempts have been made to cut short the ten-dency to the pseudo-membranous formation by the insufflation of powdered quinine sulphate, but hitherto without much effect, and the application is often quite painful.

DIPHTHERITIC CONJUNCTIVITIS.—The rarest form of conjunctival inflam-mation, as it is the most dangerous to the eye in its destructive tendencies, is the diphtheritic. This disease, though not uncommon in Berlin and some portions of northeastern Germany, is relatively rare in other parts of the Continent of Europe, and absolutely rare in Great Britain and the United States. During a period of ten years' connection with the New York Eye Infirmary, and also with several other public hospitals, and an observation of more than twenty thousand cases of eye disease, the writer has seen but ten cases of true, unmistakable diphtheritic conjunctivitis, as seen at the Berlin clinics. This is a fortunate exemption from the disastrous consequences of a rapidly destructive disease.

Diphtheritic conjunctivitis is characterized by a very marked swelling of the lids, due to a more or less *extensive infiltration*, not only of the *entire conjunctiva* but also of the *other tissues of the lid*, sometimes even including the *integument*, by an inflammatory product of marked coagulability. This infiltration is *into the tissue* of the conjunctiva, and not an exudation *upon its surface*. The local heat of the parts is very pronounced. The infiltration

into the lids is so great that they become almost like a board, look and feel like brawn, and can not be everted. This dense infiltration often drives all the blood out of the eyelids, and, instead of presenting a livid appearance, as in the purulent form of conjunctivitis, they appear dusky yellow, and even blanched. As a consequence of this extensive and rapidly occurring infiltration, the nutrition of the parts is interfered with or entirely cut off, and the conjunctiva changed into a necrotic mass and cast off as a slough. This necrosis sometimes extends deeper than the conjunctiva, and an extensive loss of substance in the lid tissues occurs. When the strangulation is not so extensive in the lid, and the skin looks angry and reddened, the dense, hard, brawn-like condition of the lids is sufficient to distinguish the case as one of diphtheritic conjunctivitis. Such a case can not be mistaken for purulent ophthalmia. When it is possible to evert the lid in part, the inner surface is seen to be of a gray or grayish-yellow color, usually bloodless, which appearance is due to an infiltration of the entire thickness of the conjunctiva, and not to the formation of a membrane upon its epithelial surface.

During this first stage of the disease the exudation from the conjunctiva is usually slight, and consists of a thin, dirty, very hot, ichorous fluid, containing yellowish shreds and some cells. This exudation in the second stage changes in character, and becomes puriform and finally purulent. The disease is rapid in its progress, and reaches its height usually within a few days. The ocular conjunctiva becomes densely infiltrated, and surrounds the cornea like a hard, unyielding wall. There are usually but few blood-vessels to be seen, but numerous punctate hæmorrhages are not infrequent. After the disease has lasted from five to eight days, the hard, board-like condition of the lids diminishes, small sloughs begin to appear in the conjunctiva, the latter becomes loose, red, and bleeding, and assumes the appearance of a suppurating or granulating surface. The ocular conjunctiva takes on the same change; the lids can be everted, the secretion becomes purulent, and the second stage has begun. This stage lasts a varying time, differing in no respect from an ordinary purulent ophthalmia, and terminates in the third or cicatricial stage. This latter is the deeper and more extensive, the greater was the destruction by necrosis following the infiltration.

This description of the disease in its various stages we owe originally to von Graefe, who first differentiated it as a distinct affection. Any one who has once seen such a case can not fail to make a diagnosis in subsequent cases. Usually the general condition of the patient affected with diphtheritic conjunctivitis is bad. The eye may be the only organ affected by the disease, though often the nose, the throat, and the ears are all involved in the process. The local manifestation of the diphtheritic poison may appear first in the conjunctiva, or it may spread from the nose or throat to the eye. In North Germany diphtheritic conjunctivitis is a not infrequent complication of malignant scarlatina. It occurs more often in children than in adults, thus resembling the croupous form of inflammation. The diphtheritic process in the conjunctiva is probably caused by the presence of lower organisms, and

the chief part in the infiltration is taken by cellular elements, which are so numerous and so densely packed together as to obliterate the vessels and cut off the circulation.

From this rapid survey of the symptoms and course of a diphtheritic conjunctivitis, it will be seen that there are always necrosis of tissue, loss of substance, and cicatrization in the lid, none of which evils occur in the purulent or membranous forms of conjunctivitis. In all three stages of the disease, as in purulent and membranous ophthalmia, the great danger is ulceration and necrosis of the cornea; and the more the ocular conjunctiva is involved the greater is the danger. The nutrition of the cornea may be so rapidly interfered with that it may become entirely opaque within forty-eight hours; and when this occurs it sloughs out almost always entire, like a watch-crystal from its frame. Where the cornea is not entirely surrounded by the brawny conjunctiva, part of it can generally be saved, even in its transparency, though this is rare.

The prognosis in a case of diphtheritic conjunctivitis is almost always bad, owing to the very rapid strangulation of the tissues. Not uncommonly the lower lid becomes excoriated upon its skin surface by the acridity of the discharge in the first stage, and becomes covered by a diphtheritic membrane. Fortunately, the disease is rare among new-born children; it occurs more frequently, according to German authorities, between the ages of two and seven. In this country and in Great Britain the disease appears only sporadically, but in Berlin and East Prussia epidemics have been known to occur on several occasions. It is extremely contagious, and this is now the explanation of the occurrence of epidemics, the disease being propagated by infection with the secretion.

One point in the pathology of the disease has given rise to an almost endless discussion, which in some quarters has not yet been satisfactorily settled, viz., whether the disease is ever produced by infection with the purulent secretion from a non-diphtheritic case. The establishment of this fact would militate strongly against the doctrine that diphtheritic conjunctivitis is a distinct disease. Yet there seems no good reason for doubting that diphtheritic conjunctivitis has been produced by infection with the purulent secretion of a gonorrhœal conjunctivitis, for it was frequently seen at von Graefe's clinic in Berlin and elsewhere. Yet von Graefe himself defined it as a general constitutional disease, and clearly differentiated it from purulent conjunctivitis. In view of the authenticity of the cases above referred to, we must agree with the modified statement of von Graefe that, while in many cases diphtheritic conjunctivitis is a symptom of a general disease, yet there are cases in which it is a local disorder, caused by infection with the secretion from a purulent ophthalmia. The reverse of the case has also been stated to be true, on the authority of Horner, who states that, though the discharge from a case of diphtheritic conjunctivitis, when applied to a healthy conjunctiva, usually reproduces diphtheritic conjunctivitis, it does not always do so; for purulent conjunctivitis has been known to result from such infec-

tion. This would seem as if purulent and diphtheritic conjunctivitis were intimately connected, and leaves the pathogenesis of the latter still in an unsettled state.

The disease is not always binocular, and great care must therefore be taken of the unaffected eye. If the case be seen early enough, some impermeable or hermetically-sealed bandage should be applied, the best being that of Dr. Buller, of Montreal, through the glass center of which the eye may be constantly watched. Yet this is not always a protection, for, when there is a constitutional blood disorder at the bottom of the disease, of course no external protecting bandage would be of any avail. The treatment must be in the beginning decidedly antiphlogistic. Iced compresses must be constantly applied and continually changed throughout the first or diphtheritic stage. Local bleeding by means of leeches to the temple may prove necessary, but there is some danger of a diphtheritic membrane forming upon the bites. Scarifications of the ocular conjunctiva do no good, and should not be undertaken. *No caustics should ever be employed in the first stage, as they would do positive harm.* If the cornea become involved early in the disease, there is almost no hope of saving it, for the cold applications aid in its necrosis, while it would scarcely be safe to use warm applications to the lids. As soon, however, as the violent signs of inflammation diminish, it is better to employ moist warmth in order to facilitate the slough of the necrosed conjunctival tissue. When the second or purulent stage has fairly begun, then the application of caustics is indicated under the same rules as apply to true purulent conjunctivitis. The same rules also apply to the use of atropine or eserine in the diphtheritic form as in the purulent form. As soon as the stage of cicatrization has begun, it is better to stop the use of caustics, as they do no good, and may do harm. Cleanliness in all three stages is very important, and the best means thereto is a one-per-cent. solution of carbolic acid, applied with a brush or gently injected under the lids.

Reviews and Literary Notes.

Lehrbuch der hygienischen Untersuchungsmethoden. Eine Anleitung zur Anstellung hygienischer Untersuchungen und zur Begutachtung hygienischer Fragen für Aerzte und Chemiker, Sanitäts- und Verwaltungsbeamte, sowie Studirende. Von Dr. Med. C. FLÜGGE, Privatdocent an der Universität Berlin. Mit 88 Abbildungen im Text, 17 Tabellen, und 4 lithographirten Tafeln. Leipzig: Veit & Co., 1881. Pp. xviii–602.

To attempt to review a work which is itself a review of almost the entire range of sanitary literature would require a space as great as that of

the book before us, which gives, in phrase as concise as is compatible with perspicuity, descriptions of the different processes employed in every department of hygienic inquiry, with critical comparisons of their relative merits, and impartial considerations of the etiological significance of the various conditions ascertained by them. Of the importance of such a treatise no one need be told who knows how much of sciolism has been grafted upon the slender stock of science in connection with preventive medicine; how many theories of pathogenesis are founded upon pet processes of one-sided examination; and how prone is the ordinary mind to confound occasional coincidences with causal relations.

The main divisions of the work are under the usual headings of Air; Soil; Water; Food; Ferments, Microzymes, and Disinfectants; Special Surroundings of Man, comprising Clothing, Habitation, Ventilation, Heating, Illumination, Disposal of Refuse, Occupation; Epidemiology; and Statistics. The methods of examination are ranged in sequence as physical, chemical, and microscopical, wherever these are applicable. In the first section, after an exhaustive summary of ordinary meteorological processes and results, we find an interesting chapter on ozonometry, a subject which has lately been agitating the mind of a special committee of the American Medical Association, and than which none in the whole range of hygiene has been involved in greater uncertainty. The primary difficulty, as every sanitarian knows, is to differentiate the reactions of ozone from those of hydrogen peroxide (Schönbein's so-called antozone), nitrous or chlorinated compounds, bromine, etc. For this purpose numerous differential tests are given. For example:

OZONE	PEROXIDE OF HYDROGEN
Converts suboxide of manganese (mangan-oxydulsalz) into peroxide; bronzes paper prepared with sulphate of manganese.	Decolorizes solution of permanganate; bleaches sulphate-of-manganese paper which was bronzed by ozone.
Changes ferrocyanide of potassium to ferridcyanide.	Reduces ferridcyanide of potassium to ferrocyanide.
Bronzes thallium paper.	Bleaches thallium paper bronzed by ozone.
Decolorizes indigo solution; strikes a blue tint immediately with tincture of guaiacum.	Decolorizes indigo solution only after the addition of sulphate of iron; gives a blue tint with guaiacum only in the presence of blood or extract of malt.

Sulphate of manganese serves to distinguish free bromine or chlorine from ozone, which alone produces the brown coloration. Manganese or thallium paper remains unaffected by nitrous compounds, while litmus paper may determine the absence of free nitrous acid. Peroxide of hydrogen is discriminated from these other oxidizing substances by the last-mentioned of the above-tabulated differential tests. Mere qualitative ozonometry, therefore, is by no means so simple an affair as beginners in hygiene are apt to imagine; and when we come to quantitative estimation the problem is infinitely more complicated. Most of the sources of fallacy in the